APPENDIX 4.4

Greenhouse Gas Calculations

Gallery at Central Park
Summary of Annual Greenhouse Gas Emissions

Source	Construction Emissions (metric tons/yr)	Operational Emissions						
		Mobile Sources (metric tons/yr)	Area Sources (metric tons/yr)	Electrical Generation (metric tons/yr)	Water Supply (metric tons/yr)	Wastewater Treatment (metric tons/yr)	Solid Waste (metric tons/yr)	Total (metric tons/yr)
Proposed Land Uses	1,422.9	6,955.4	1,139.4	4,356.0	183.6	202.5	33.9	12,870.6
Existing Land Use	NA	635.2	40.1	259.9	71.4	6.9	2.8	1,016.2
Net GHG Emissions	1,422.9	6,320.2	1,099.3	4,096.1	112.2	195.6	31.1	11,854.5

Gallery at Central Park
Greenhouse Gas Emissions from Construction

Construction Year	GHG (tons/year) CO_2	CO_2E
2009	579.30	579.8
Off-Road Diesel	342.75	342.8
On-Road Diesel	226.76	226.8
Worker Trips	9.79	10.3
2010	1,386.18	1,422.9
Off-Road Diesel	350.58	350.6
On-Road Diesel	337.66	337.7
Worker Trips	697.94	734.7
2011	1,374.45	1,413.9
Off-Road Diesel	268.85	268.9
On-Road Diesel	355.21	355.2
Worker Trips	750.39	789.9
Maximum		1,422.9

Gallery at Central Park
Greenhouse Gas Emissions from Motor Vehicles

Source	Annual CO_2 Emissions (tons/yr)[1]	Annual CO_2E Emissions (metric tons/yr)[2,3]
Proposed Land Uses	7,283.7	6,955.4
Existing Land Use	665.2	635.2
Net Proposed Project	6,618.5	6,320.2

1. Estimated emissions from URBEMIS2007
2. CO_2 emissions are assumed to be 95% of GHG emissions on a CO_2 equivalent basis. (U.S. EPA, "Emission Facts - Greenhouse Gas Emissions from a Typical Passenger Vehicle", Office of Transportation and Air Quality, EPA420-F-05-004, February 2005)
3. 1 metric ton = 1.102 tons

Gallery at Central Park
Greenhouse Gas Emissions from Area Sources

GHG	Natural Gas Emission Factor (kg/MMBtu)[1]	GWP
CO_2	53.06	1
N_2O	0.0001	310
CH_4	0.0059	21
CO_2E (multiplier)	1.0029	

Case	Annual CO_2 (tons/yr)[2]	Annual CO_2E (MT CO_2/yr)[3]
Proposed Land Uses (NG)	1,248.20	1,136.0
Proposed Land Uses (LM/H)	3.72	3.4
Total		1,139.4
Existing Land Uses (NG)	43.80	39.9
Existing Land Uses (LM/H)	0.25	0.2
Total		40.1

1. CA Climate Action Registry, General Reporting Protocol, 2008.
2. Estimated CO_2 emissions from URBEMIS2007
3. 1 metric ton = 1.102 tons

Where:

CH_4	methane
CO_2	carbon dioxide
CO_2E	carbon dioxide equivalent
GWP	global warming potential
kg/MMBtu	kilograms/million Btu
MT	metric ton
N_2O	nitrous oxide
yr	year

Gallery at Central Park
Greenhouse Gas Emissions from Project Electrical Demand

Case	Land Use	Units	Electrical Demand Factor[1,2] (kWh/unit/yr)	CO_2E Emission Factor[2] (lbs CO_2E/kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Proposed Uses	Single-Family Residential	45 DU	6,700.00	0.880	120.35
	Apartment - Low Rise	536 DU	16,984.70	0.880	3,633.88
	Condo/Townhouse	225 DU	6,700.00	0.880	601.74
	Total				4,355.96
Existing Uses	Medical Office	30,000 sf	21.70	0.880	259.85
Net Proposed Project					4,096.11

Sources:

1. Fairfield Residential LLC (Karen Van Winkle) 6/27/08. Electrical demand for apartments includes pools, parking structures, offices, and related uses (proposed uses).

2. South Coast Air Quality Management District, CEQA Air Quality Handbook, (1993) Table A9-11-A (existing uses).

3. California Climate Action Registry, General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions Version 3.0, (2008) 91-93.

Where:

CO_2E	carbon dioxide equivalent
kW-hr	kilowatt-hour
lbs	pounds
MT	metric tons (= 2,204.62 lbs)
yr	year

Gallery at Central Park
Greenhouse Gas Emissions from Potable Water Supply, Conveyance, Treatment, and Distribution

Case	Activity	Potable Water Needs Estimate[1] (Mgal/yr)	Electrical Demand Factor[2,3] (kW-hr/Mgal)	Annual Electrical Demand (10^6 kW-hr/year)	CO_2E Emission Factor[4] (lbs CO_2E/kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Proposed	Supply & Conveyance	131.40	2,117	0.278	0.880	111.04
	Treatment	131.40	111	0.015	0.880	5.82
	Distribution	131.40	1,272	0.167	0.880	66.72
	Total					183.57
Existing	Supply & Conveyance	51.10	2,117	0.108	0.880	43.18
	Treatment	51.10	111	0.006	0.880	2.26
	Distribution	51.10	1,272	0.065	0.880	25.95
	Total					71.39
Net Proposed Project						112.18

Sources:

1. Section 4.5, Hydrology and Water Quality.
2. California Energy Commission, *California's Water-Energy Relationship, Final Staff Report (CEC-700-2005-011-SF)*, (2005) 26.
3. California Energy Commission, *Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118)*, (2006) 22. Prepared by Navigant Consulting, Inc.
4. California Climate Action Registry, General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions Version 3.0, (2008) 91-93.

Where:

CO_2E	carbon dioxide equivalent
GWP	global warming potential
kW-hr	kilowatt-hour
lbs	pounds
Mgal	million gallons
MT	metric ton
N_2O	nitrous oxide
yr	year

Gallery at Central Park
Greenhouse Gas Emissions from Wastewater Treatment

Wasterwater Treatment

Case	Estimated Population/ Square Feet[1]	Per Unit Wastewater Generation Rate[2] (gal/yr)	Electrical Demand Factor[3] (kW-hr/Mgal)	Annual Demand Factor (10^6 kW-hr/yr)	CO_2E Emission Factor[4] (lbs CO_2E/kW-hr)	Annual CO_2E Emissions (MT CO_2E/yr)
Proposed	2,080 Pop	23,329	1,911	0.093	0.880	37.01
Existing	30,000 SF	55	1,911	0.003	0.880	1.25
Total Net Proposed Project						35.76

Sources:

1. Section 4.8, Population and Housing.
2. Section 4.12, Utilities and Service Systems.
3. California Energy Commission, Refining Estimates of Water-Related Energy Use in California, PIER Final Project Report (CEC-500-2006-118), (2006) 22. Prepared by Navigant Consulting, Inc.
4. California Climate Action Registry, General Reporting Protocol: Reporting Entity-Wide Greenhouse Gas Emissions Version 3.0, (2008) 91-93.

Wastewater Treatment Process

Case	Estimated Population/ Square Feet[1]	Per Unit CO_2 Emission Factor GWP=1 (MT CO_2/yr)	Per Unit CH_4 Emission Factor[2] GWP=21 (MT CO_2E/yr)	Per Unit N_2O Emission Factor[2] GWP=310 (MT CO_2E/yr)	Annual CO_2E Emissions (MT CO_2E/yr)
Proposed	2,080 Pop	-	0.053	0.027	165.44
Existing	30,000 SF	-	0.0001	0.0001	5.60
Total Net Proposed Project					159.8

Sources:

1. State of California, Department of Finance, *E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2007, with 2000 Benchmark*, (2007). Based on a population rate of 3.099 persons per household for the City of Santa Clarita (value rounded up).
2. US Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2006 (EPA 430-R-08-005)*, (2008) 8-15. The emissions were divided by the population of the United States in 2006, estimated at 303,000,000, to obtain a per capita value. The factors for CH4 and N2O for the existing 30,000 square foot structures were estimated using the ratio of wastewater generated on a per unit basis (i.e., 23,329/55).

Where:

CH_4	methane
CO_2	carbon dioxide
CO_2E	carbon dioxide equivalent
gal	gallons
GWP	global warming potential
kW-hr	kilowatt-hour
lbs	pounds
Mgal	million gallons
MT	metric ton
N_2O	nitrous oxide
yr	year

Gallery at Central Park
Greenhouse Gas Emissions from Solid Waste

Case	Solid Waste Generation[1] (MT/yr)	CO_2E Emission Factor[2] (MT CO_2E/MT waste)	Annual CO_2E Emissions (MT CO_2E/yr)
Proposed	655.61	0.11	72.12
Existing	54.43	0.11	5.99
Net Project	601.18	0.11	66.13
Diversion 53%	(318.63)	0.11	(35.05)
Total Net Proposed Project	282.56	0.11	31.08

Sources:
1. Section 4.12, Utilities and Service Systems. Values converted to metric tonnes.

2. US Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Greenhouse Gas Emission Factors for Management of Selected Materials in Municipal Solid Waste (EPA-530-R-98-013)*, (1998). The factor is based on mixed municipal solid waste as disposed in landfills without landfill gas recovery.

Where:

CO_2E	carbon dioxide equivalent
MT	metric ton
yr	year